

# The Role of Scheme Method to Improve the Ability in Solving Mathematical Word Problems

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## Abstract

Solving mathematical word problems are not easy for elementary school students. Third-grade students of elementary schools cannot understand mathematical word problems perfectly. The appropriate learning method is needed to improve the students' ability in understanding to solve the questions. Therefore, the objective of this study is to identify the role of the scheme learning method to improve students' ability in solving mathematical word problems. Third-grade students of elementary school took the process of this research. The students were divided into two groups; experimental and control groups. This research would be carried out in three sessions. The measurement of the students' ability in solving the mathematical word problems was conducted by giving the pre-test and post-test mathematics materials. Data analysis performed used *anava* mixed design to compare score of students' abilities in solving the mathematical word problems between experimental and control groups. The result of this study indicated that there were differences in score of students' abilities in solving the mathematical word problems between experimental group and control group ( $p=0,039$ ,  $p<0,05$ ). Students who received scheme learning method increased their score more than control group. Applying this method can improved students' ability in solving mathematical word problems.

**Keywords:** scheme learning method, mathematical word problems, ability in solving mathematical word problems.

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## Introduction

Results of Monitoring and Evaluation (ME) of Center for Development and Empowerment of Mathematic Educators and Educational Staff (P4TK) in the year 2007 and The National Development Training Center for Mathematic Teachers (PPPG) of Yogyakarta in previous years showed that more than 50% of primary school teachers said that most students have difficulties in solving mathematical word problems (Raharjo, 2008). After further investigation, difficulty in completing mathematical word problems is particularly often experienced by third-grade students of elementary school, especially in solving arithmetic story problems that include addition and subtraction (Fuchs, et al., 2004; Fuchs, et al., 2008; Jitendra, Sczesniak, Griffin, and Buchman, 2007). Information obtained from the principal at one of

elementary schools in Sleman Regency in April 2010, third-grade students usually obtain low average grades in math and seem to experience difficulty with mathematical word problems. Based on interviews with 3 teachers who teach grade 3 at several elementary schools in Sleman in April 2010, there were some students who have difficulty in solving mathematical word problems. It impacts on the number of students who get math scores below the average grade in semester 1. The same thing also happened in some primary schools in Gunungkidul. Based on interviews with 2 third-grade teachers of elementary schools and observations of students' math scores in June 2010 obtained information that the third-grade students seem to experience difficulties in mathematics. They have difficulty in mastering the basic material in semester 1 which includes the operations of counting numbers including math questions which involve story form. Therefore, math grades in

semester 1 for two years in a row were always in the lowest position compared with other subjects.

Solving mathematical word problems is more complex phase in learning mathematics. Before entering stage about the mathematical word problems, necessary provision is a mastery of basic math ability. According to Geary in Bjorklund (2005), basic math skill consists of numerosity (knowing the numbers, able to write and mention it), ordinality (being able to compare some numbers, which is the bigger which is the smaller, counting (being able to count objects), and simple arithmetic (being able to solve simple arithmetic operations).

Geary (2000) stated that the arithmetic development on students of kindergarten and first-grade of primary school includes the ability to solve simple math, for example  $5 + 7 = \dots$ . First-grade students also have learned to solve simple arithmetic word problems, i.e. using words that are commonly known and including the addition or subtraction in 1 step. Second-grade students are able to solve mathematical word problems that include addition and subtraction in 2 steps. Afterwards, starting from third-grade to higher levels students have been able to solve arithmetic operations or more complex mathematical word problems, including count of 3-4 numbers and mixed mathematical word problems. Based on this opinion, it can be seen that third-grade student is a transition stage from simple count solving to more complex count and word problems. Related to learning method used by teachers in explaining the mathematical word problems, the researcher conducted observations at four elementary schools in Yogyakarta (two schools in Gunungkidul and two schools in Sleman). Based on observation, 3rd grade teachers at these schools tend to explain the material verbally, without using visual aids or image as practiced by teachers in the first and second grades in providing explanation of mathematic problems in story form. Therefore, there are some students who do not understand the presented material. Reviewing from cognitive development stage, students in third grade are at the

same stage with students in first and second grades which are located at the concrete operational stage (Santrock, 2007). Considering this condition, it needs concrete material delivery as delivering mathematic questions in form of story to first and second students so that students can understand the material and have a basic understanding of concepts to solve mathematic problems in story form correctly. Thus, the standard of math competency for third grade is that students are able to perform arithmetic operations to 3 digit numbers, one of indicators of competence is being able to solve mathematical word problems related to addition and subtraction (Model Syllabus Learning Thematic grade 3, 2007).

Critical components in completing mathematical word problems include a specific group of knowledge (understanding the concept along with the fluency in counting), a sustainable strategy and the ability to manage time to do the problems on a regular basis (Damon & Lerner, 2006). Understanding the concept or understanding of question is an important factor for students to solve mathematical word problems correctly. According to Siegler (2008) components in the process of reading comprehension include identifying words and adjusting it to the information stored in long-term memory, linking words with sentences in the reading, combining perception of themselves with the sentences in the reading., and connecting the read matters with the owned knowledge.

Two basic processes that contribute to improve reading comprehension is the automation of the identification of words and the increasing of efficient operation of memory performance (Siegler & Alibali, 2005). Memory work is necessary to connect the meaning with experience. There is a scheme stored in memory. The scheme is a mental picture of information processing. The scheme is a structure or a series of concepts that organizes a range of information into a meaningful concept (Schunks, 2008). According to Piaget in Slavin (1991), the scheme is defined as a pattern of behavior / thoughts that is used by children or adults

to translate the things seen and encountered in various conditions. The scheme is a path of thinking to solve problems. The scheme is also known as the characterized list that is a set of characteristics of a stimulus that is stored in memory and then matched by a perception system with the stimulus that comes to determine whether a person or object has been known previously or not (Atkinson, Atkinson, Hilgard, 1998). The development of understanding of mathematic concepts requires an external representation such as pictures, graphs, tables, diagrams that seemed to act as stimulus and would help to understand certain concepts (Pape & Tchoshanov, 2001). Those representations are helping someone to review the ideas, thoughts and to make conclusion. The representation is related to the scheme (mental image) which is owned by an individual. External representation of a scheme in the form of a visual drawing of thought flow will regulate certain patterns as an effort to solve the problems that are abstract. Based on these explanations, the learning method using a scheme that will be used in this research is a method inspired from the mental picture (scheme) possessed by every individual as well as the ability to represent the mental image visually. Therefore, in the process of learning, students will be guided to describe the flow of thought to understand the problem and then solve mathematic mathematical word problems.

The method of this scheme will be applied to the third grade students of elementary school. Based on field observation, the children of grade 3 of elementary school in average are 8-9 years old. Reviewed, from Piaget's cognitive development, they are in concrete operational stage. In the concrete operational stage, children can perform logical operation and reasoning replacing intuitive thought as long as reasoning can be applied to the example of experience in real conditions (Santrock, 2007). Children have been able to develop the ability to retain information for a long time, as long as the information relates to a grouping, the series (sequence) and the concept of numbers (Hergenhahn & Olson, 1997). It is further discussed

by Hetherington & Parke (2003) that students who are in the concrete operational stage still seem difficult to do the settlement of a problem which is described verbally so they need a more concrete visual images to be able to solve the problem. Considering the concept of the scheme associated with the development of third-grade students of elementary school, the scheme method used in this research can be used to give an understanding concept for students, especially in the completion of math problems in story form.

Several studies using the concept of scheme usually use schema-based instruction (SBI) term (Fuchs, et al., 2004; Jitendra, et al, 2002; Jitendra & Hoff, 1996). These studies translate mental images or behavioral patterns in an image of thinking groove (scheme) visually. The results of these studies indicate that the SBI can improve the ability of children in solving mathematic problems in form of story (Fuchs, et al., 2004; Jitendra, et al, 2002; Jitendra & Hoff, 1996). Concept used in this study adapts the research of Fuchs, et al (2004), which was conducted on a group of third grade students of elementary school with varying achievements then they were divided into experimental and control groups. However, the materials which were provided and the time of delivery of content are adjusted to the elementary school materials and curriculums of third grade of elementary schools used as places of conducting research. Time delivery of content was based on the syllabus of the mathematics subject in topic arithmetic operations of addition and subtraction, i.e. one-time session for 2 hours of lessons (2x35 minutes).

Based on several studies, researcher will conduct research using the scheme method in several schools that 50% of students earn math scores below the KKM or less than 6. This research is important to do regarding the ability to complete mathematical word problems related to addition and subtraction is a basic concept that must be owned by students. This basic concept will affect students' skills in solving mathematical word problems in higher grades. In addition, this study is expected to

give a method of learning math in story form in accordance with the stages of cognitive development of third grade students of elementary schools. The purpose of this study is to investigate the role of learning methods using the scheme to improve the ability of students to solve mathematical word problems on third grade students of elementary school. The hypothesis of this research is there a difference in solving mathematical word problems in terms of provision of learning methods using the scheme, the learning method using the scheme can improve the ability to solve mathematical word problems.

## Method

### Subjects

Subjects consisted of 44 students. As many as 24 students as the experimental group came from one elementary school in the northern border of Wonosari town, while 20 students as the control group were from another school in the southern border of Wonosari. Both schools used as places of research are equivalent in several aspects of equality as follows.

1. The same accreditation standards
2. Based on the documentation of math scores of grade 3 semester 1, showed that 50% of students obtain grades below the KKM (minimum completeness criteria) or less than 6
3. The location is at the outskirts of town with relatively same background job of parents
4. The same learning model of mathematics especially in explaining about the mathematical word problems used by teachers in teaching.

Third grade students who become research subjects will be given inform consent as a sheet of willingness and approval to engage in research. Inform consent for teachers would be signed by the

concerned teacher and researcher, while for students would be signed by the researcher, the parents, the school and the Faculty of Psychology Universitas Gadjah Mada.

### Manipulation

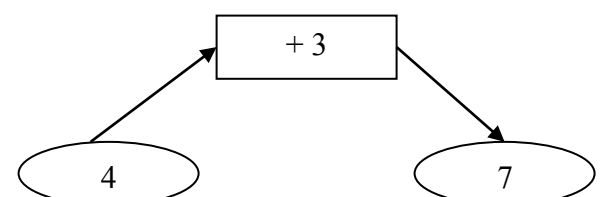
Teaching guide which would be used in teaching and learning process with scheme method was inspired by the method of schema-based instruction of researches of Jitendra, et al (2007), Jitendra (2002) and Jitendra, AK & Hoff, K., (1996). Based on previous studies and theoretical framework used, the concepts that are used as stage to teach in the learning method using this scheme include below.

Reading questions and identifying the major numbers in question

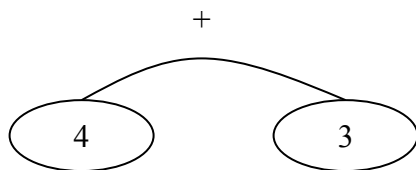
1. Describing the thinking groove of students
2. Identifying keywords by asking the meaning of keywords associated with daily experiences of students.
3. Determining the sign of arithmetic operations based on the results of the identification of keywords.
4. Writing a mathematic sentence.
5. Solving problems

This method is tested on 30 students of third grade of elementary schools who have the same characteristics with the subject of research. The result indicates that the general method of scheme can be understood by students. However there is little change in the depiction of the flow line of thinking, because there are some students showed confusion seeing picture of thinking groove as follows:

Figure 1: Scheme before trial.



Therefore, the image of thinking groove was changed as follows:  
Figure 2: Scheme after trial



Sentence of math:  $4 + 3 = 7$

The picture above is used to develop teaching guides in the research.

## Measurement

At the beginning of the intervention, all subjects get the pre test and in the end they get a post-test intervention. Both the pre test and post test use math achievement test. According to Azwar (1996) learning achievement test is test which is planned to reveal the maximum performance in mastering the subject material or material that has been taught. Achievement test used is arranged in parallel consisting of math problems in story form on the 1 step sum and 1 step reduction. The purpose of the test preparation in parallel is to avoid learning effects and to avoid boredom on the students because doing the same 2 test twice. Parallel assumption used is both tests measure the same thing and have the same difficulty level. Preparation of achievement test is also based on curriculum of grade three of elementary school subject in the topic of arithmetic operations of addition and subtraction in reference books and learning provided by teachers in the classroom, which involve 3-4 digit numbers, and discuss the matter of one step addition and subtraction in mathematical word problems.

Testing the validity of the test of mathematics achievement through content validity is estimated by testing against the item problems with rational analysis and professional judgment. After testing the validity, test of mathematics achievement was tested on a number of third graders of elementary schools. Estimation of

reliability calculation used Cronbach alpha counting technique. Reliability test results for pretest achievement test produced an alpha value of 0.712, while the posttest produced an alpha value of 0.733.

Besides, an analysis of the index of difficulty using the ITEMAN program item was also conducted. According to Azwar (2006), the index of item difficulty in about 0.5 is considered the best. Furthermore, categorization of abortion item used r values of correlation indices biserial on ITEMAN program. Item distribution before and after the abortion can be seen in the following table 1.

Table 1. Table of item distribution before and after abortion

Type of Test	Original Items	Aborted Items	Number of Remaining Items
Pretest	1,2,3,4,5,6,7,8,9,10	2,3,6	7 items
Post-test	1,2,3,4,5,6,7,8,9,10	6,8,10	7 items

During the intervention process, there is an observer who will observe and record the course of intervention. Observer is a graduate of the Faculty of Psychology, University of Sanata Dharma in Yogyakarta, which had joined the consulting agency of Faculty of Psychology that has experience in observing the behavior of subjects, especially children. Task of observer is to make record related to the following matters: how teachers teach, students' response to material presented by the teacher as well as conditions in the classroom during the learning process.

## Research Design

This research used a quasi experimental method. Design of experiment in this study is the untreated control group design with pretest and post test, namely the design of experiments that provide treatment in the experimental group and no treatment in the control group (Shadish, Cook, Campbell, 2002).

The study design is illustrated in Figure 3 as follows.

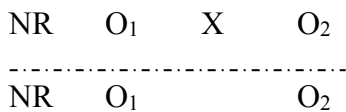


Figure 3. Experimental Design

Description:

NR: Non-random

X: treatment / intervention

O1: observation 1 (pretest)

O2: observation 2 (post-test)

## Research Procedure

### *The training of the use of teaching guidelines*

Material presenters in this study were class teachers who teach in the classroom that will be used as the experimental group. Furthermore, teachers received training on the use of the scheme method. Before the training is done, teachers get teaching guide to be read and observed at home. Training was conducted in 2 meetings.

### *Implementation of intervention*

The implementation of intervention was carried out based Learning Implementation Plan (RPP) with the material standard of competency number of arithmetic operations addition and subtraction (Model Syllabus and RPP, 2008). Implementation of the intervention consisted of 3 meetings with each meeting for 60 minutes (2 hours of lessons). Subject matter or materials used in research is one step addition and subtraction as basic competence in solving the problem before reaching the stage of more complex story question. Chronology of research included the following stages: pretest - session 1 - session 2 - session 3 – post-test.

### *Follow-up*

The process of follow-up was done with the method of scheme learning in the control group. The goal was giving the same rights in the control group as a research subject and also as moral responsibility of researcher in the control group who had contributed as research subject. Follow-up was conducted after the research ended.

## Data analysis

Data analysis used mixed Anava, namely the analysis of variance that includes combining two sub-analysis of Within Subject Test (testing of score difference in 1 group, pretest and post-test) and Between Subject Test (testing of score difference between groups, experimental and control).

## Results

### Description of pretest-posttest score

Pretest-posttest results showed that the average performance in solving mathematic problems in the form of story in the experimental group increased. The mean of pretest score of math grades before getting scheme method was 4.17. After getting the scheme method, the mean score of posttest of math grades was 5.96. The mean increased by 1.79. Meanwhile in the control group, the mean pretest score of mathematics achievement test was 4.05, the mean posttest score was 4.75. The mean increased by 0.70. The difference of increased scores in the experimental group is higher than the increase in the control group. The comparison results before (pretest) and after (posttest) the intervention is presented in Table 3.

Table 3. Pretest-posttest scores Student Ability in Solving Mathematic Problems in form of Story on Experimental Group and Control Group

Groups	Number of Subjects	Pretest			Posttest			difference
		min	Max	Mean	min	max	mean	
Experimental	24	1	6	4,17	3	7	5.96	1,79
Control	20	1	6	4,05	1	7	4,75	0,70

### *Homogeneity test*

Homogeneity test was carried out using t-test to determine whether the two variants were homogeneous before getting the intervention. Based on the t-test to pretest scores, it can be seen that the value of  $F = 1.361$  with significance level  $p = 0.250$  ( $p > 0.05$ ), meaning that prior to treatment there was no difference in variance in the data capabilities of students in completing math problems in the form of story in the experimental group and control group. The calculation result shows that both variants were homogeneous, then the calculation of  $t$  is based on equal variances assumed (assumed that two variants are same).  $T$  value indicates  $0.263$  with  $p = 0.794$  ( $p > 0.05$ ), so it can be interpreted that the mean of experimental group and control groups prior to treatment is same in other words there is no difference in the level of performance in solving mathematic problems in the form of story on students.

### *Hypothesis Test*

The hypothesis which would be tested in this study was there is difference in ability to solve mathematic problems in story form viewed from provision of scheme method, the method can serve to improve performance in solving mathematic problems in story form. Testing of the role of schema method includes two factors, namely time measurement consisting of 2 types of tests; pretest and posttest, and the condition of measurement consisting of 2 types of groups: the experimental and control groups. Therefore, an analysis using mixed Anava was used to determine the differences shown by the significant interaction between these 2 factors. The result shows that there is interaction between the test

and the group with the  $F$  test \* group = 4.544 and level of significance is 0.039 ( $p < 0.05$ ). The interaction indicates that the change in pretest to posttest scores in both groups (experimental and control) is significantly different.

After identifying the interaction, the analysis was continued to find out further about the changes in pretest and posttest scores in each group and the direction of change scores, an increase or decrease. Analysis showed that changes in performance in solving mathematic problems in the form of a story in the experimental group is significant with a mean of difference  $-1.792$  and level of significance  $p = 0.001$ . Meanwhile, the change in performance in solving mathematic problems in story form in the control group is not significant (mean of difference  $-0.700$  and level of significance  $p = 0.071$  or  $p > 0.05$ ). Negative mean difference value indicates that the posttest mean is higher than the mean pretest. This shows that the method of the scheme given to the experimental group is quite effective to improve performance in solving mathematic problems in story form.

Based on analysis using the mixed Anava can be concluded that there is significant difference in math problem solving skills in story form between the experimental and control groups. Method of scheme given in the experimental group can improve performance in solving mathematic problems in story form. This means that the hypothesis in this study is received. Effective contribution of scheme method to enhance ability in solving mathematic problems in story form is 39.1%.

## Discussion

Based on the analysis using mixed Anava can be seen that there is significant difference in ability to solve mathematic problems in story form between experimental and control groups with  $F = 4.544$  and  $p = 0.039$  ( $p < 0.05$ ). Method of scheme given to experimental group can improve the score of performance in solving mathematic problems in story form. Improvement of ability of students after obtaining scheme method in the research is in line with the research result of Fuchs, et al (2004) which showed that the experimental group experienced improvement of scores of average posttest in solving math problem in the form of story compared to the control group. In addition, research of Jitendra & Hoff (1996) conducted in 3 students of classes 3 and 4 of elementary school, and according to their teachers had difficulty in mathematics showed that the number of correct answers in solving mathematic problems in the form of story increased after getting the scheme method of learning.

Scheme of method which can improve performance in solving mathematic problems in the form of story refers to the opinion of Jitendra & Hoff (1996), due to the scheme method leads students to make the representation of problems that lead to a settlement of the problem. The main characteristic of the use of the scheme in solving the problem is by using the scheme will help students to organize the problem to facilitate understanding and problem solving (Jitendra, 2002). The researches using the scheme to facilitate the completion of mathematic problems in the form of story use visual images to help students representing the problem in a concrete channel. This is in accordance with the view of Atkinson, Atkinson, Hilgard (1998) who stated that the symbolic description is very useful because it forms a symbolic picture of visual imagery that is usually more effective to translate the flow of thinking in solving problems.

Suitability of scheme method used as a method of learning for third grade students of elementary school is in line with the stages of cognitive

development of students. Viewed from age, 7-11 year old children are at the concrete operational stage (Santrock, 2007), meaning that students in grade 3 are at the same cognitive stage with students in grade 1 and 2. However, students of class 3 get more complex materials and method of learning about the mathematical word problems verbally, in contrast to class 1 and 2 students who study the material that is more simple and concrete method of learning. As a result, many students of class 3 obtain low grades in mathematics. In addition, according Rahardjo (2008) the high number of students who get declining grade in class 3 is caused by the learning given is not complete yet, meaning that starting from concrete to abstract explanations based on cognitive development of students. Based on the result of the research, students can learn the material about mathematical word problems with a concrete explanation and preceded by an adjustment problems ranging from simple sequences and increases toward a more complex matter. Therefore, it is important to note that provision and delivery of material should be in accordance with the cognitive development of students so that students can understand the material well. In other words, learning about mathematical word problems for grade 3 of elementary schools still needs concrete explanations considering their stage of cognitive development is still equivalent to the cognitive development of second grade students of primary school.

Scheme learning method in this research is conducted with the stages of content delivery as follows: reading questions and identifying the main numbers in the questions by drawing and writing important figures on the board, describing the thinking groove of students, identifying the keywords by asking the meaning of keywords associated with daily experiences of students, determining the sign of arithmetic operations based on the results of the identification of key words, writing mathematic sentences and solving the math problems. In addition, in this research, students directed to learn about the mathematical word problems starting from the basic stage to the more complex one. The goal is that students can adjust to



the new material considering their stage of cognitive development is equivalent to students in grade 1 and 2 of elementary schools. The basic stage of understanding about mathematical word problems of addition and subtraction includes mathematical word problems about one step addition and subtraction, whereas a more complex phase that is used as a follow-up covering mathematical word problems about two steps addition and subtraction and mixed questions. Basic material given in the intervention process is expected to provide a solid understanding for students. Students who already understand the basic problem-solving at the basic stage can be easier to solve more complex problems.

Picture of students' response to a given learning method and its influence on the ability of solving the problem can be known from the results of observations at each research session. Conclusion obtained from the observations in both experimental and control groups in sessions 1 to 3 are such as the learning method using scheme seems to more attract the attention of students because teachers do not only explain verbally but also provide a visual picture on the board. Explanation of the scheme method seems to more enhance students' understanding in solving mathematic story problems, this is in accordance with the opinions of Atkinson, Atkinson, Hilgard (1998) who stated that visual imagery is usually more effective to translate the flow of thinking in solving problems. Besides, in term of cognitive development of grade 3 students who are at the concrete operational stage, Hetherington & Parke (2003) stated that students who are at the concrete operational stage still seem difficult to complete problems described verbally so they need visual picture which is more concrete in order to solve the problem. Results of data analysis reinforced the opinion that the explanation in concrete way can enhance the understanding shown by students who obtain the scheme method experience higher improvement than the group of students who do not get the scheme method.

Students' way by writing mathematic sentences seems more concrete and lead to the completion

process than the method used in the control group that asking students to do completion of problems by writing identified matters, asked matters, mathematic process, completion and conclusion. This was allegedly due to third grade students of elementary school still struggle to rewrite and re-express the things that have been understood. At the end of the study, teachers in the control group stated that the method of verbal explanation as well as method of work on the problems that requires students to write down things that are known, asked, math process, completion and the conclusion can be applied when students are sitting in class 5 or 6, as third grade students still need an explanation in a concrete way and not yet have the ability to re-write things which have been interpreted coherently. This is in accordance with the Call' opinion (Santrock, 2007) who stated that the level of reading development of students at grade 3 more focuses on reading fluency, while the understanding which is given comes to the initial understanding to get general information but not yet to reach the stage of reading to learn and understand a more complex reading materials.

The evaluation process includes timeliness, mastery of the material by the teacher, the communication between teachers and students, attention and participation of students in receiving the material, as well as situations and conditions in the classroom in which the learning process takes place. Besides, factors that support this research are the students' attention in following the research as well as the ability of teachers to deliver material and keep the class remains conducive.

Based on research that has been done can be seen that the ability of students in grade 3 in receiving the material, especially in understanding the mathematical word problems is on stage of concrete learning. With a concrete explanation and using a visual picture on the board more attract students to listen and pay attention to things than the teachers only explain verbal explanation. According to Fuchs, Compton, Fuchs, et al (2005), attention is one of important aspects to understand the solving of math problems in story form. In line with this opinion, the

experimental group who get the scheme method shows an improved understanding in solving math problems in story form as compared with the control group. In addition, material of mathematical word problems for grade 3 which consists of the sum, reduction or even a matter of the mixture needs to be simplified in the delivery process. It is better if before coming to the mixed questions, teacher asks the students to the basic problems of 1 step addition and subtraction. The explanation which starts at the basic stage to the complex one makes students to understand the basic concepts so that they can more easily understand the more complex problems. It can be seen after the research ended and teachers continue learning process about mathematical word problems for 2-step addition and subtraction and the mixed ones, students seemed more easily to understand the questions because they have already acquired basic understanding during the research.

After the research ended, the teacher understands that so far the story question is considered difficult by students both at grade 3 to grade 6 because as they were in grade 3 do not understand the problem-solving for mathematical word problems so it will be brought up to grade 4 and subsequent classes. The learning process which is carried out so far both in the selection of questions and time allocation depends on the matter in a reference book, although some problems in reference books directly lead to more complex mathematical word problems, such as mixed question, thus making students feel difficulty. In addition, teachers are lack to convey explanation from simple step to the complex one and tend to give a verbal explanation. Therefore, with this research,

students showed improvement in solving problems than students in previous years due to the explanation of the material is done by depicting the flow of thinking visually so that students gain a concrete picture and can understand the context well. In addition, the material is given systematically starting from simple questions and developing to more complex ones, so students do not experience material changes drastically from grade 2 to grade 3, considering the grade 3 and grade 2 are at the same stages of cognitive development. Explanation of material gradually allows students to master the material from basic level and developing further to more complex one. Therefore, the learning process experienced by students during the research has an impact on improving their understanding in solving mathematic problems in form of story.

### **Conclusion**

Based on research results above, it can be concluded that the method of learning using the scheme can improve the ability of students to solve mathematical word problems. Experimental group received the learning method using scheme showed improved ability to solve mathematic problems in the form of story higher than the control group. Based on the research, third grade students of elementary school who are at the concrete operational stage require explanation of materials in concrete terms and gradually. Therefore, it can be suggested that in the delivery of learning methods can be developed by using pictures or other props, so they can help students to understand the explanation.

## References

- Atkinson, R.L., Atkinson, R.C., Hilgard, E.R. (1998). *Introduction of Psychology (eight edition)*. Jakarta: Erlangga.
- Azwar, S. (1996). *Achievement Test: The Function and Development of The Measurement of Learning Achievement*. Yogyakarta: Pustaka Pelajar
- Azwar, S. (2006). *Validity and Reability*. Yogyakarta: Pustaka Pelajar
- Bjorklund, D.F. (2005). *Children's Thinking Cognitive Development and Individual Differences*. Wadsworth: Thompson Learning, Inc.
- Damon, W & Lerner, M. (2006). *Handbook of Child Psychology (6th edition)*. New Jersey: John Wiley & Son, Inc.
- Fuchs, L.S., Seethaler, P.M., Powell, S.R., Fuchs, D., Hamlett, C.L., & Fletcher, J.M. (2008) Effects of preventative tutoring on the mathematical problem solving of third-grade students with math and reading difficulties. *Exceptional Children*, 74, 155-173.
- Fuchs, L.S., Compton, D.L., Fuchs, D., Paulsen, K., Bryant, J.D., Hamlett, C.L. (2005). The prevention, identification, and cognitive determinants of math difficulty. *Journal of Educational Psychology*. 97(3), 493-513.
- Fuchs, L.S., Fuchs, D., Prentice, K., Hamlett, C.L., Finelli, R., Courey, S.J. (2004). Enhancing mathematical problem solving among third-grade student with schema-based instruction. *Journal of Educational Psychology*. 96(4), 635-647.
- Geary, D.C. (2000). From infancy to adulthood: the development of numerical abilities. *European Child & Adolescent Psychiatry*. 9 (2), 11-16.
- Hergenhahn, B.R & Olson, M.H (1997) *An Introduction To Theories Of Learning*. New Jersey: Prentice-Hall, Inc.
- Hetherington, E.M., Parke, K.D., (2003). *Child Psychology A Contemporary Viewpoint*. Boston: Mc. Graw Hill.
- Jitendra, A. (2002). Teaching Student Math Problem-Solving Through Graphic Representations. *Teaching Exeptional Children*, 34 (4), 34-38
- Jitendra, A.K., Sczesniak, E., Griffin, C.C., Buchman, A.D. (2007). Mathematical problem solving in third-grade classrooms. *Journal of Education Research*, 100(5), 282-302.

- Jitendra, A, DiPipi, C.M, Jones, N.P. (2002). An exploratory study of schema-based word-problem-solving instruction for middle school students with learning disabilities. *Journal of Special Education*, 36 (1), 23-38.
- Jitendra, A.K & Hoff, K. (1996). The effect of schema-based instruction on the mathematical word-problem-solving performance of students with learning disabilities. *Journal of Learning Disabilities*, 29 (4), 422-431.
- Pape, S.J & Tchoshanov, M.A. (2001). The Role Of Representation(s) In Developing Mathematical Understanding. *Theory into Practice*. 40 (2), 118-127.
- Raharjo, M. (2008). Learning Mathematical Word Problems about Addition and Substaction in Elementary School. Yogyakarta: Center For The Development And Empowerment of Educators And Educational Labor Of Mathematics (PPPPTK Matematika)
- Schunk, D.H. (2008). *Learning Theories: an Educational Perspective*. New Jersey: Pearson Prentice Hall.
- Santrock, J.W (2007). *Children Development*. Jakarta: Erlangga
- Shadish, W.R., Cook, T.D., Campbell, D.T. (2002). *Experimental and Quasi-Experimental Design for Generalised Causal Inference*. New York: Moughton Mifflin Company.
- Siegler, R.S & Alibali, M.W. (2005). *Children's Thinking Fourth Edition*. New Jersey: Prentice-Hall.Inc
- Sigler, Robert. (2008). Research on Teaching Comprehension. Where we've Been and When we're going. Dalam *Comprehension Instruction Research-Based Best Practices, Second Edition*. New York : The GuilFord Press.
- Slavin, RE. (1991). *Educational Psychology: Theory into Practice*. Englewood Cliffs: Prentice Hall.
- Team of authors. (2008). *Model Syllabus and Learning Implementation Plan (RPP) the World of Mathematics 3 to Elementary School Third Grade Based on Permendiknas No 22/2006 about the contents and Standards of Permendiknas 23/2006 about Standards of Competence of Graduates*. Solo: PT Tiga Serangkai Pustaka Mandiri.